Fig. 1

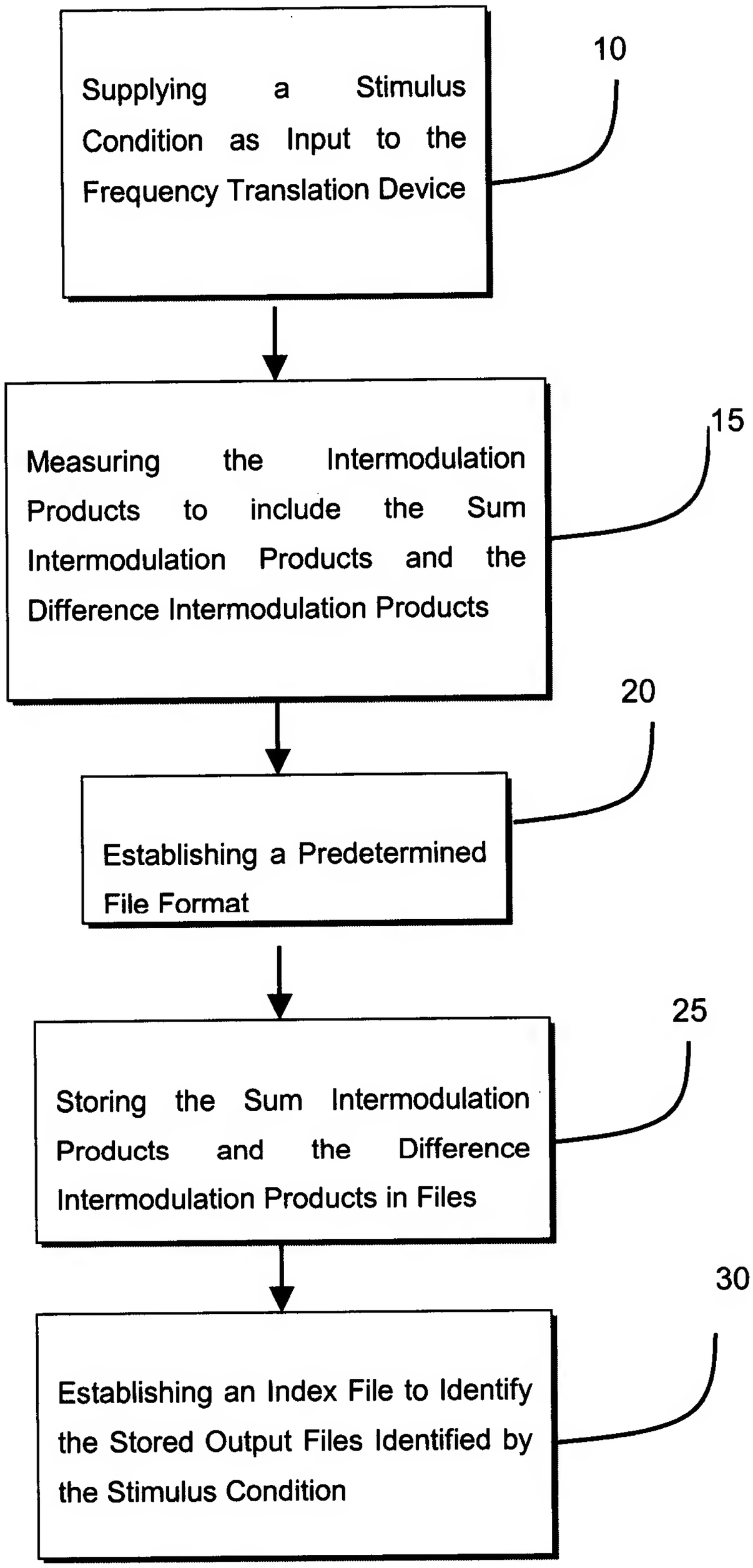

Supplying a Stimulus Condition as Input to the Frequency Translation Device
10
Measuring the Intermodulation Products to include the Sum Intermodulation Products and the Difference Intermodulation Products
15
Establishing a Predetermined File Format
20
Storing the Sum Intermodulation Products and the Difference Intermodulation Products in Files
25
Establishing an Index File to Identify the Stored Output Files Identified by the Stimulus Condition
30

Fig. 2

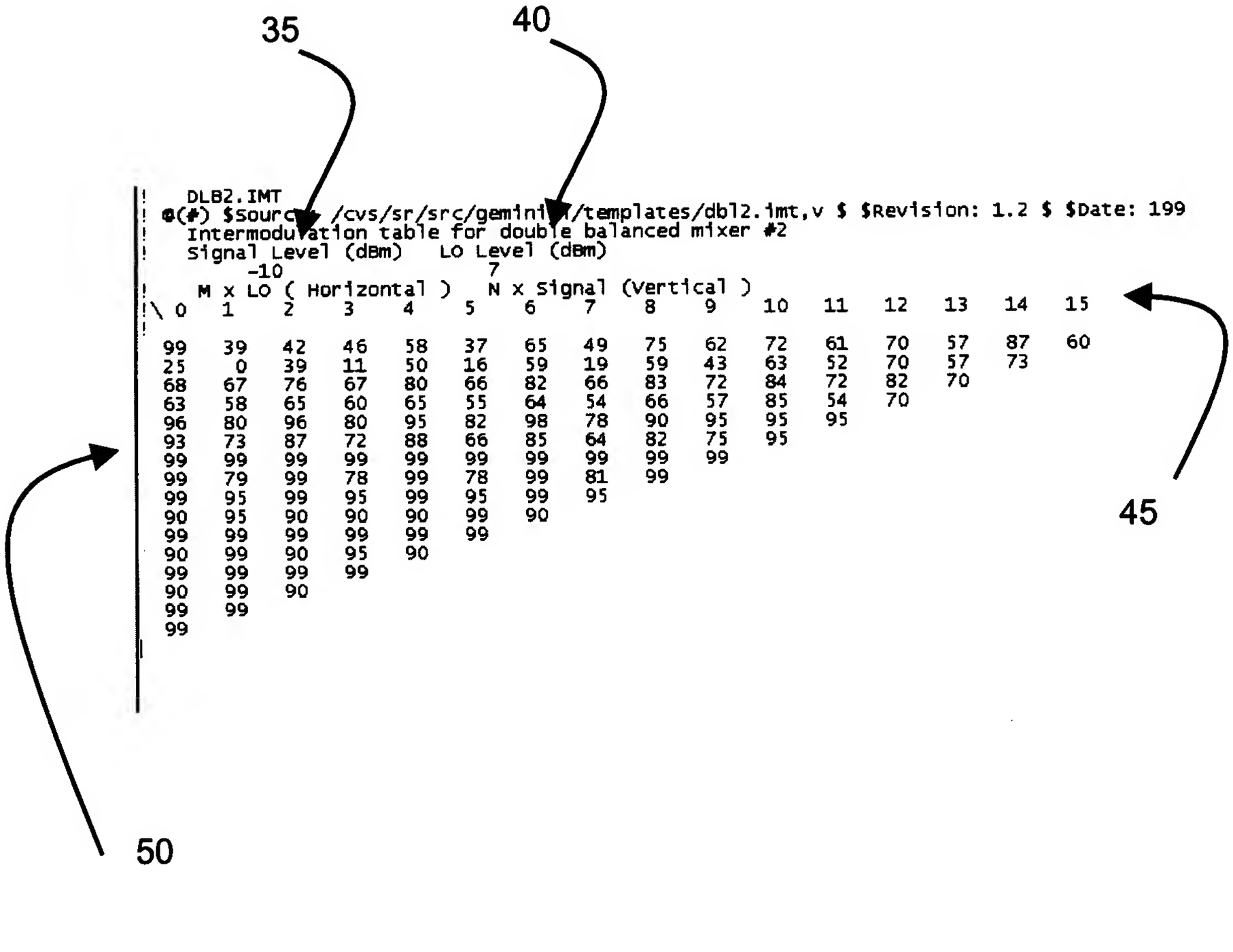

35
40
DLB2.IMT
@(#) $Source: /cvs/sr/src/geminiII/templates/dbl2.imt,v $ $Revision: 1.2 $ $Date: 199
Intermodulation table for double balanced mixer #2
Signal Level (dBm)
-10
LO Level (dBm)
7
M x LO (Horizontal)
N x Signal (Vertical)
\ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
99 39 42 46 58 37 65 49 75 62 72 61 70 57 87 60
25 0 39 11 50 16 59 19 59 43 63 52 70 57 73
68 67 76 67 80 66 82 66 83 72 84 72 82 70
63 58 65 60 65 55 64 54 66 57 85 54 70
96 80 96 80 95 82 98 78 90 95 95 95
93 73 87 72 88 66 85 64 82 75 95
99 99 99 99 99 99 99 99 99 99
99 79 99 78 99 78 99 81 99
99 95 99 95 99 95 99 95
90 95 90 90 90 99 90
99 99 99 99 99 99
90 99 90 95 90
99 99 99 99
90 99 90
99 99
99
45
50

Fig. 3

```
VAR  RF_Frequency_value(1)=915000000
VAR  RF_Power_value(1)=-20
VAR  LO_Frequency_value(1)=985000000
VAR  LO_Power_value(1)=-1.110223E-16
VAR  UpperSB(0)=1

BEGIN IM_Table
%Index(0)   ConverLoss(1)   IMT_filename(2)
 1 0.3936   SLCR_P_Lower_1_-20.txt
END

VAR  RF_Frequency_value(1)=915000000
VAR  RF_Power_value(1)=-20
VAR  LO_Frequency_value(1)=985000000
VAR  LO_Power_value(1)=-1.110223E-16
VAR  UpperSB(0)=0

BEGIN IM_Table
%Index(0)   ConverLoss(1)   IMT_filename(2)
 1 0.2360   SLCR_P_Upper_1_-20.txt
END
```

55

Fig. 4

60

RF\LO	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
0	**12**	**23**	**44**	**53**	**67**	**78**	**65**	**87**	**86**	99	99	99	99	99	99	99	15
1	**32**	**0**	66	75	86	95	99	99	99	99	99	99	99	99	99	99	14
2	**23**	43	54	99	99	99	99	99	99	99	99	99	99	99	99	99	13
3	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	12
4	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	11
5	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	10
6	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	9
7	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	8
8	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	7
9	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	6
10	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	5
11	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	4
12	99	99	99	99	99	99	99	99	99	99	99	99	99	93	99	99	3
13	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	**23**	2
14	99	99	99	99	99	99	99	99	99	99	99	99	99	65	**10**	**32**	1
15	99	99	99	99	99	99	99	86	**87**	**65**	**78**	**67**	**53**	**44**	**23**	**12**	0
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	RF\LO

Subtract

Sum

65

Fig. 5

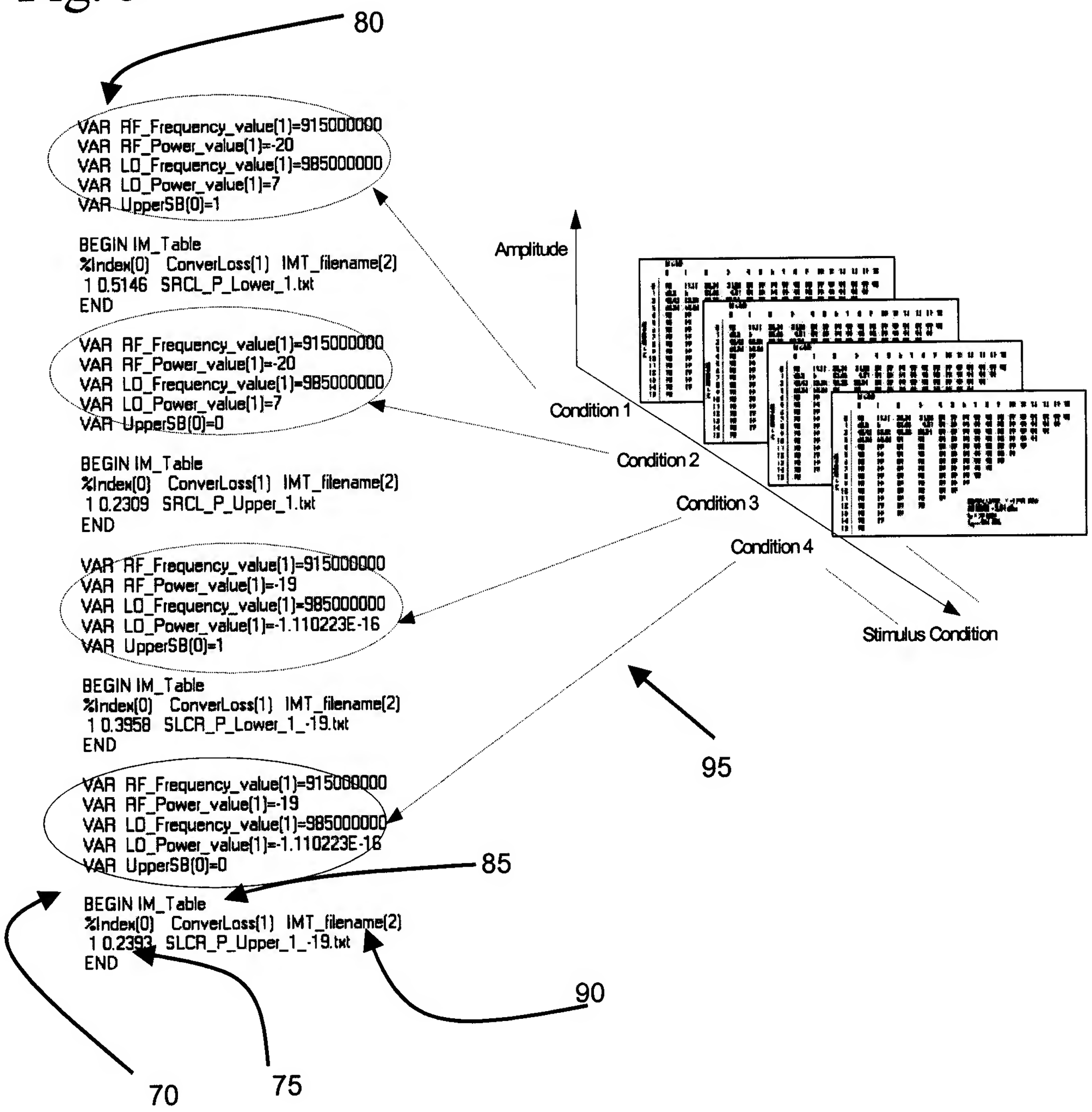

80
VAR RF_Frequency_value(1)=915000000
VAR RF_Power_value(1)=-20
VAR LO_Frequency_value(1)=985000000
VAR LO_Power_value(1)=7
VAR UpperSB(0)=1
BEGIN IM_Table
%Index(0) ConverLoss(1) IMT_filename(2)
1 0.5146 SRCL_P_Lower_1.txt
END
VAR RF_Frequency_value(1)=915000000
VAR RF_Power_value(1)=-20
VAR LO_Frequency_value(1)=985000000
VAR LO_Power_value(1)=7
VAR UpperSB(0)=0
BEGIN IM_Table
%Index(0) ConverLoss(1) IMT_filename(2)
1 0.2309 SRCL_P_Upper_1.txt
END
VAR RF_Frequency_value(1)=915000000
VAR RF_Power_value(1)=-19
VAR LO_Frequency_value(1)=985000000
VAR LO_Power_value(1)=-1.110223E-16
VAR UpperSB(0)=1
BEGIN IM_Table
%Index(0) ConverLoss(1) IMT_filename(2)
1 0.3958 SLCR_P_Lower_1_-19.txt
END
VAR RF_Frequency_value(1)=915000000
VAR RF_Power_value(1)=-19
VAR LO_Frequency_value(1)=985000000
VAR LO_Power_value(1)=-1.110223E-16
VAR UpperSB(0)=0
BEGIN IM_Table
%Index(0) ConverLoss(1) IMT_filename(2)
1 0.2393 SLCR_P_Upper_1_-19.txt
END
85
90
70
75
95
Amplitude
Condition 1
Condition 2
Condition 3
Condition 4
Stimulus Condition

Fig. 6

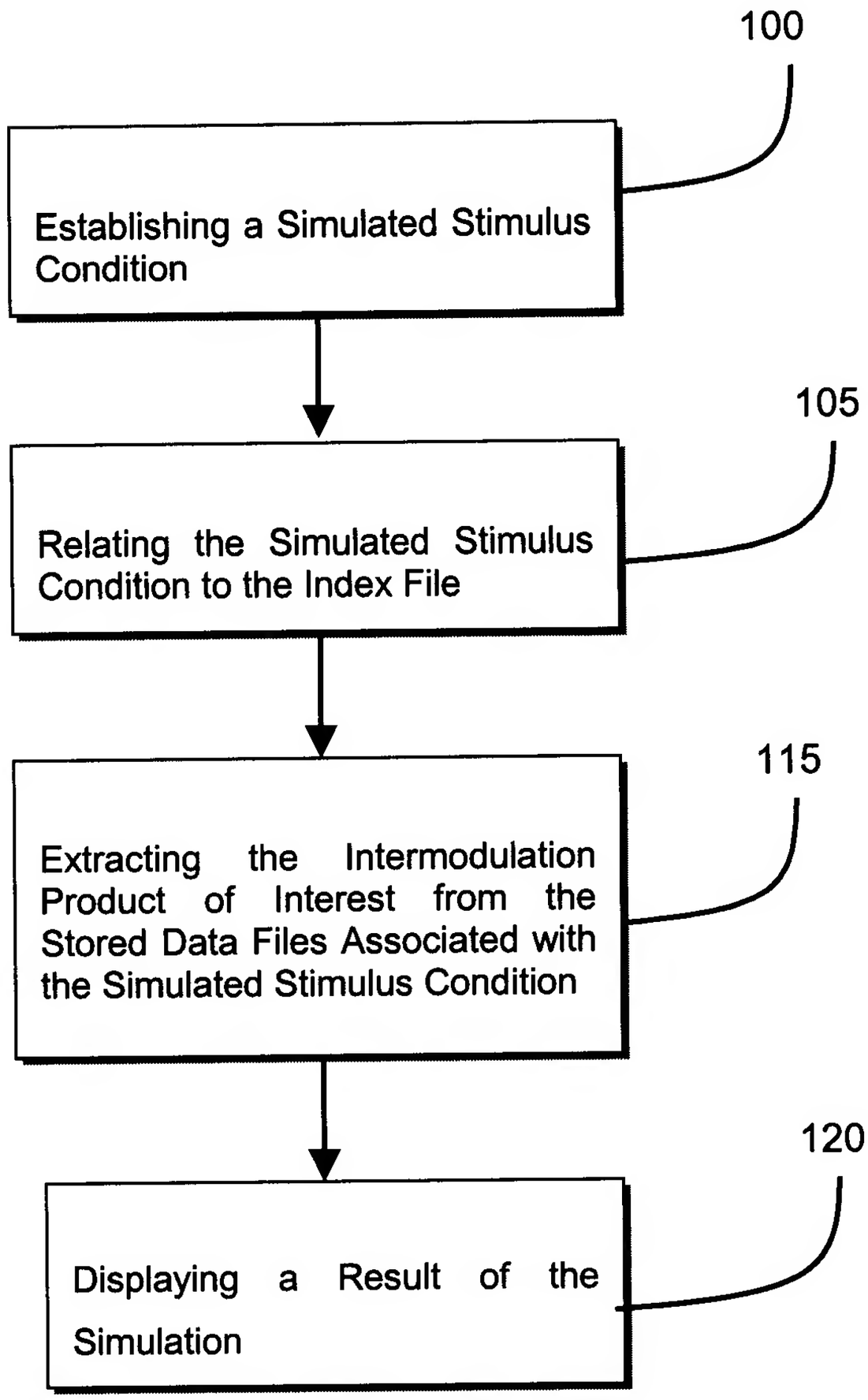

100
Establishing a Simulated Stimulus Condition
105
Relating the Simulated Stimulus Condition to the Index File
115
Extracting the Intermodulation Product of Interest from the Stored Data Files Associated with the Simulated Stimulus Condition
120
Displaying a Result of the Simulation

Fig. 7

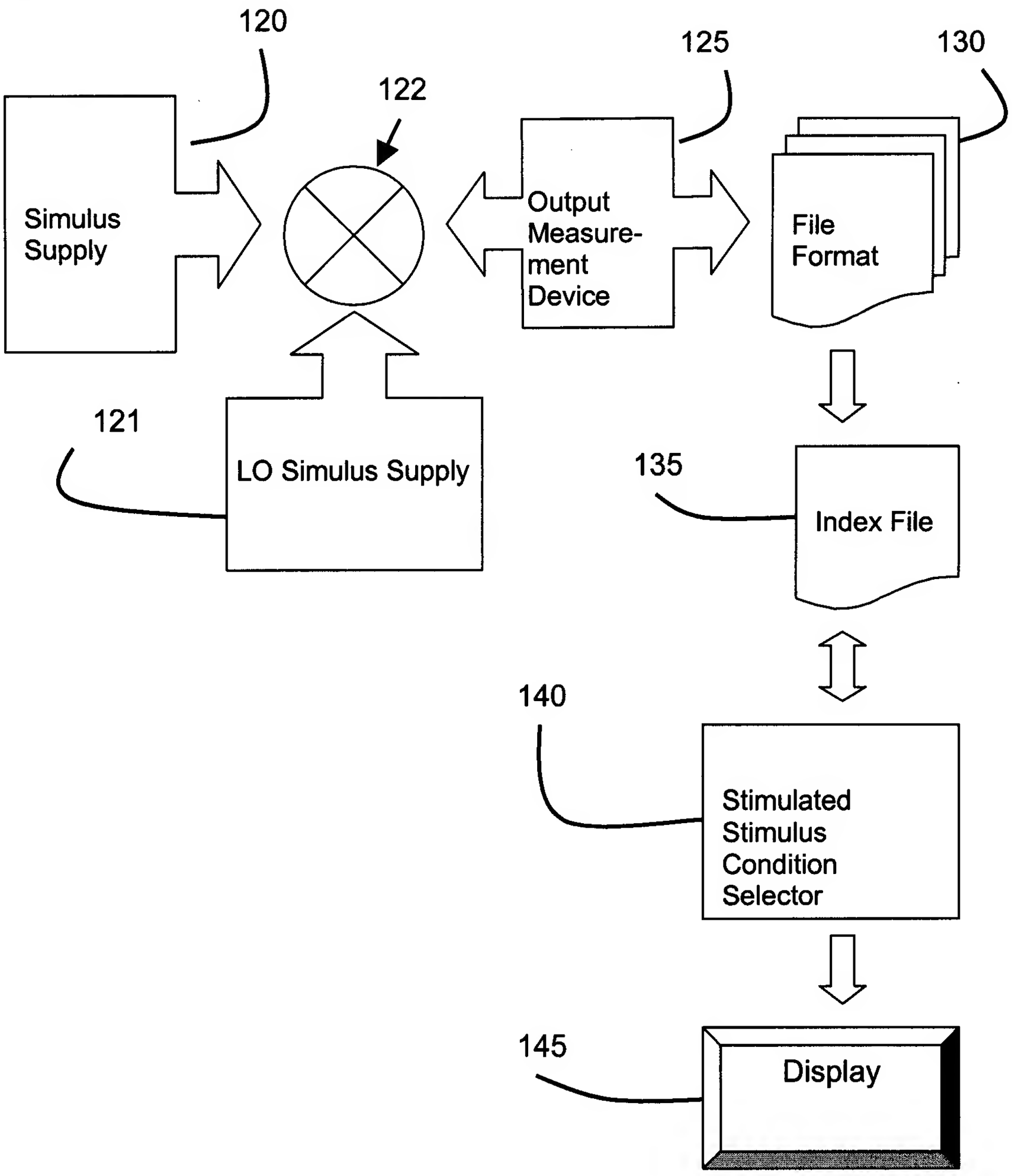

120
122
125
130
Simulus Supply
Output Measure-ment Device
File Format
121
LO Simulus Supply
135
Index File
140
Stimulated Stimulus Condition Selector
145
Display

Fig. 8

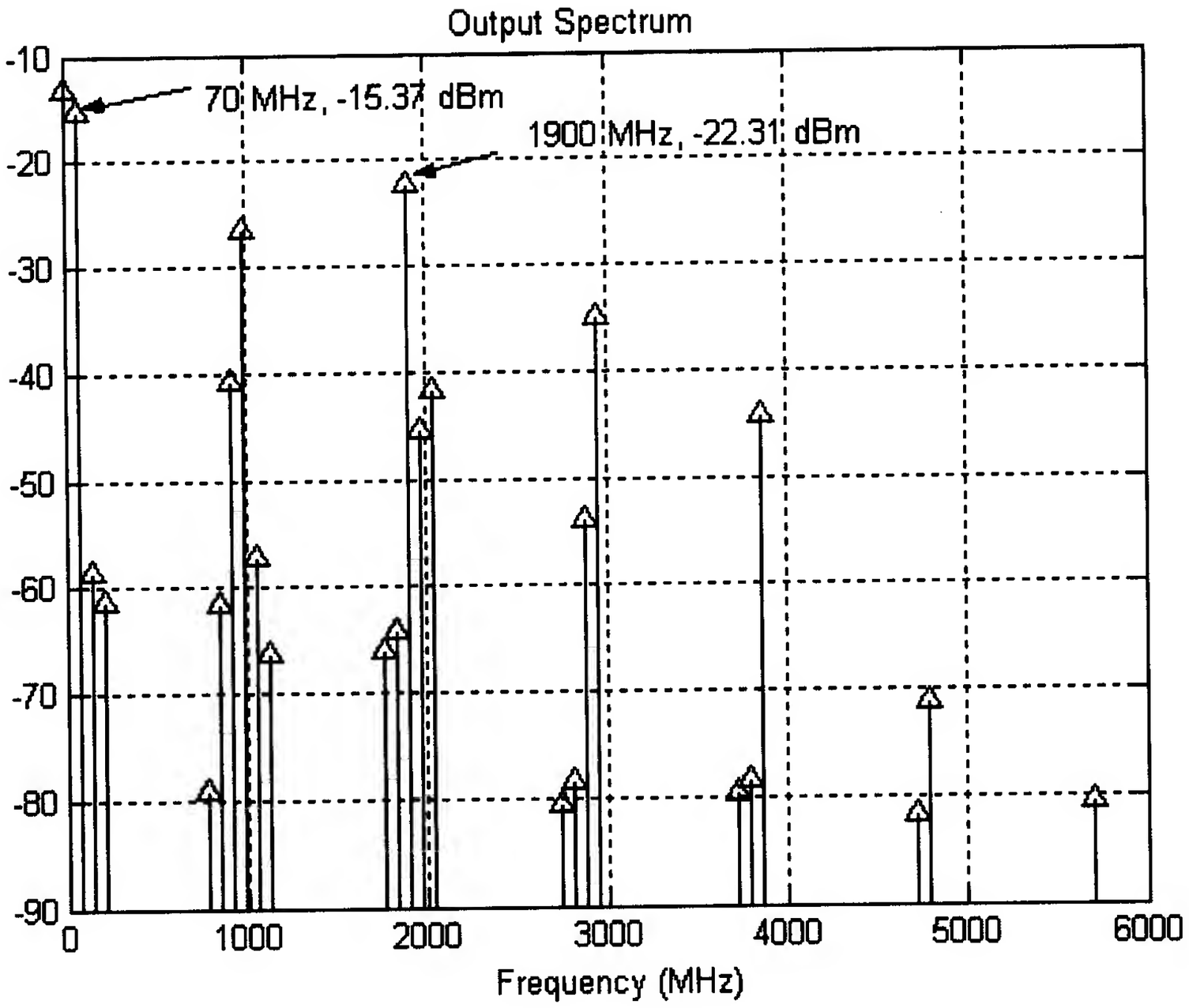

Output Spectrum
70 MHz, -15.37 dBm
1900 MHz, -22.31 dBm
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
1000
2000
3000
4000
5000
6000
Frequency (MHz)

Fig. 9

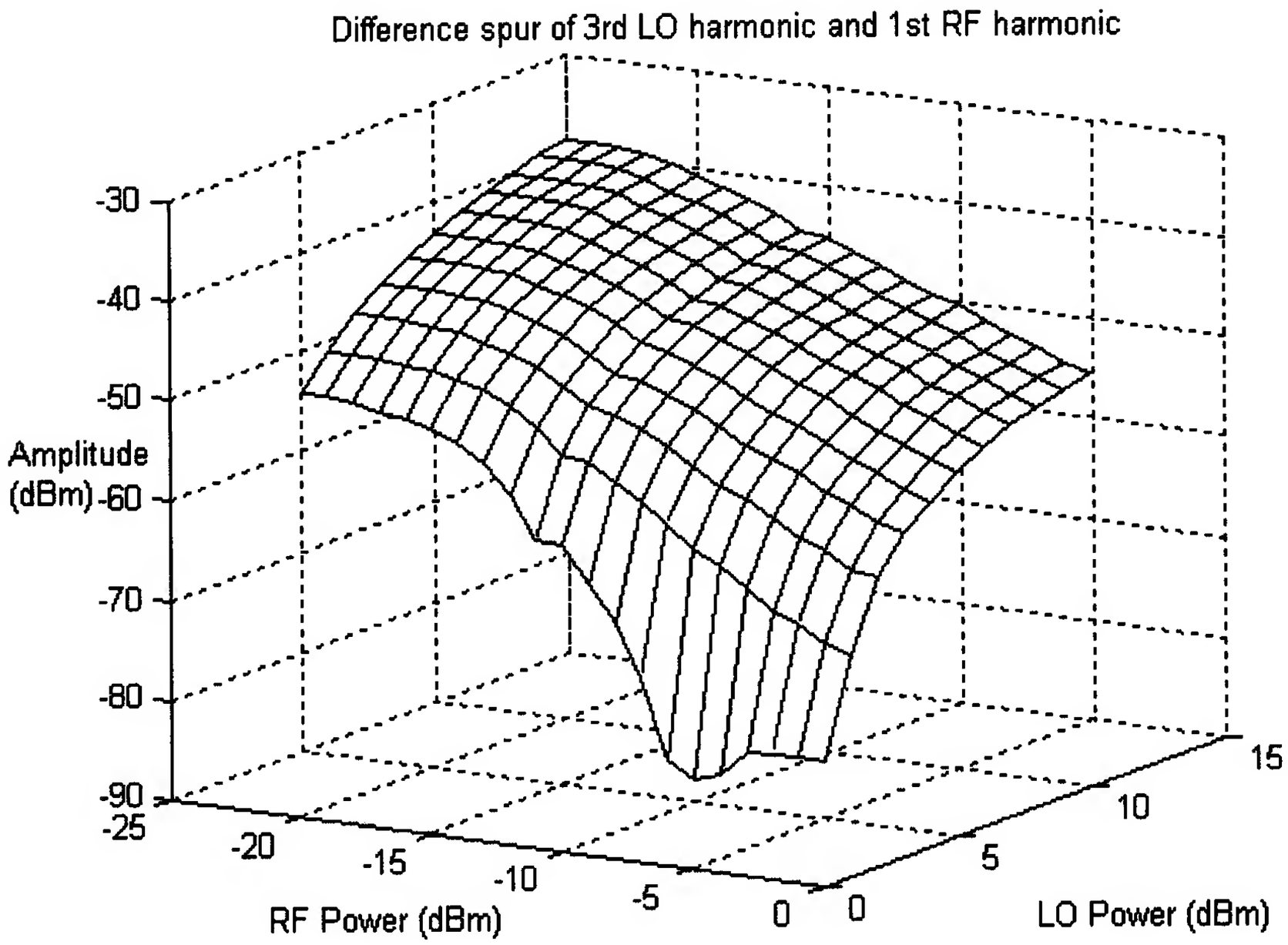

Difference spur of 3rd LO harmonic and 1st RF harmonic
Amplitude (dBm)
-30
-40
-50
-60
-70
-80
-90
-25
-20
-15
-10
-5
0
RF Power (dBm)
0
5
10
15
LO Power (dBm)

Fig. 10

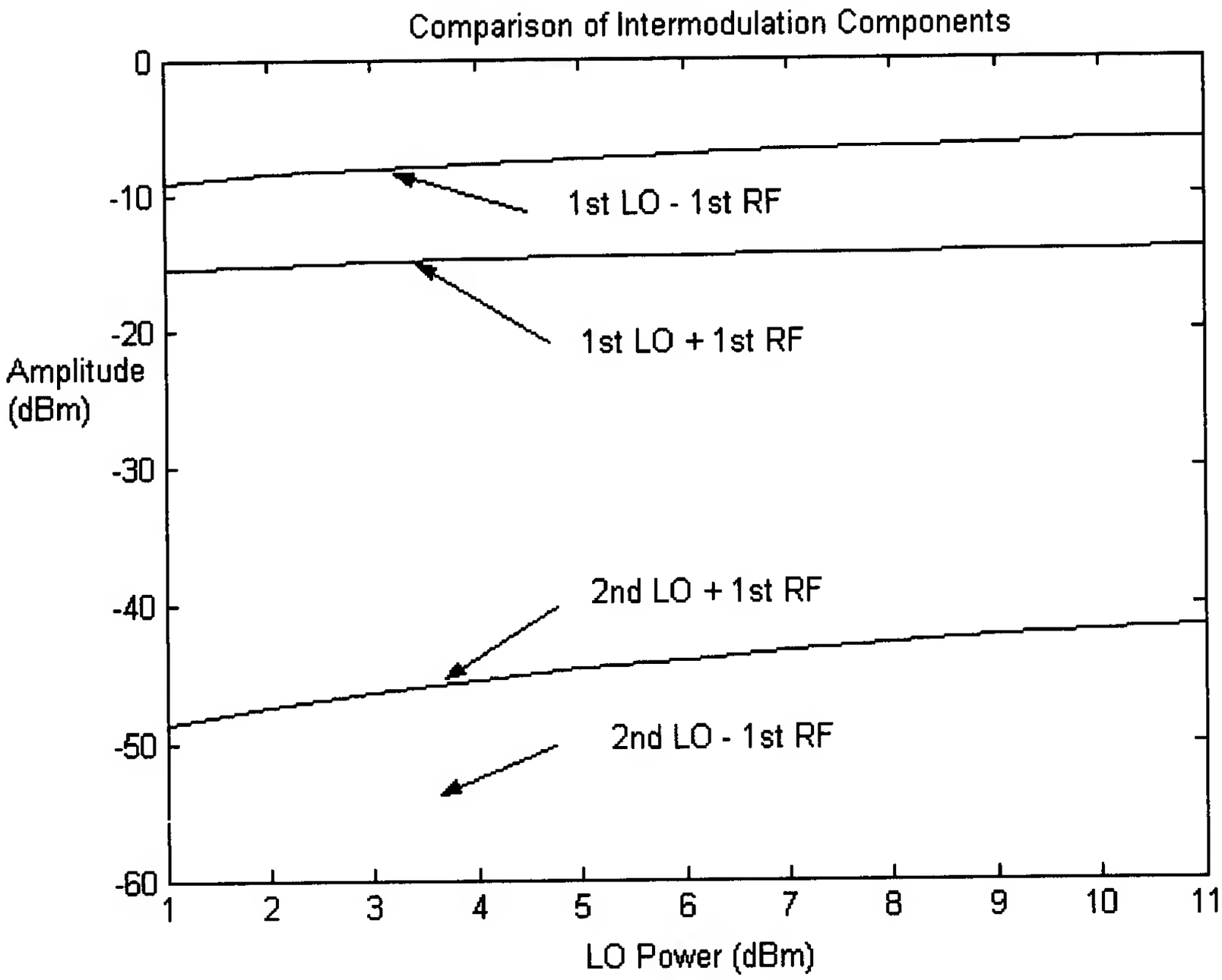
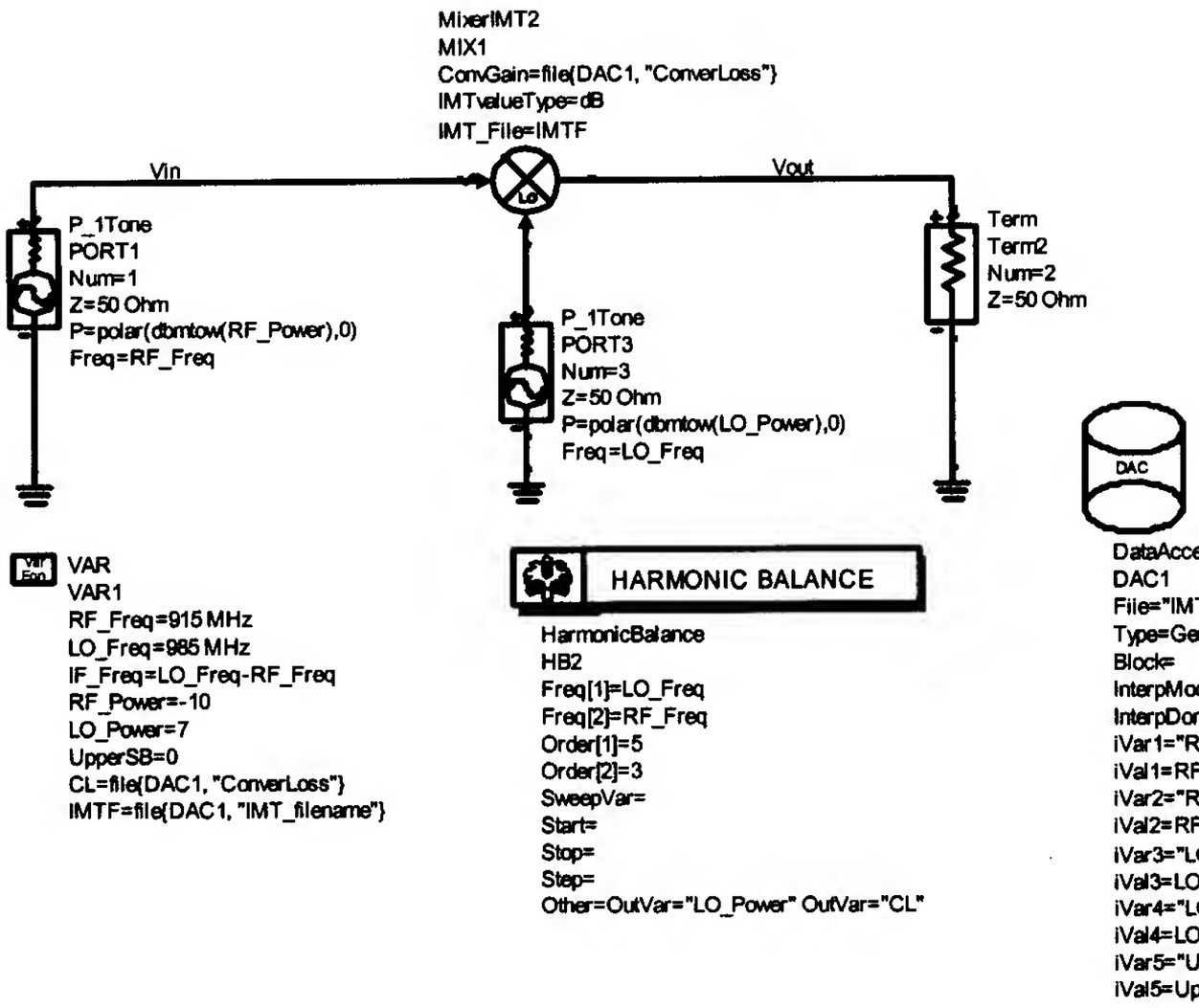

Comparison of Intermodulation Components
0
-10
-20
-30
-40
-50
-60
Amplitude (dBm)
1st LO - 1st RF
1st LO + 1st RF
2nd LO + 1st RF
2nd LO - 1st RF
1
2
3
4
5
6
7
8
9
10
11
LO Power (dBm)

Fig. 11



Stimulus condition	RF Frequency	RF Power	LO Frequency	LO Power
	915 MHz	-10 dBm	985 GHz	7 dBm

Fig. 12

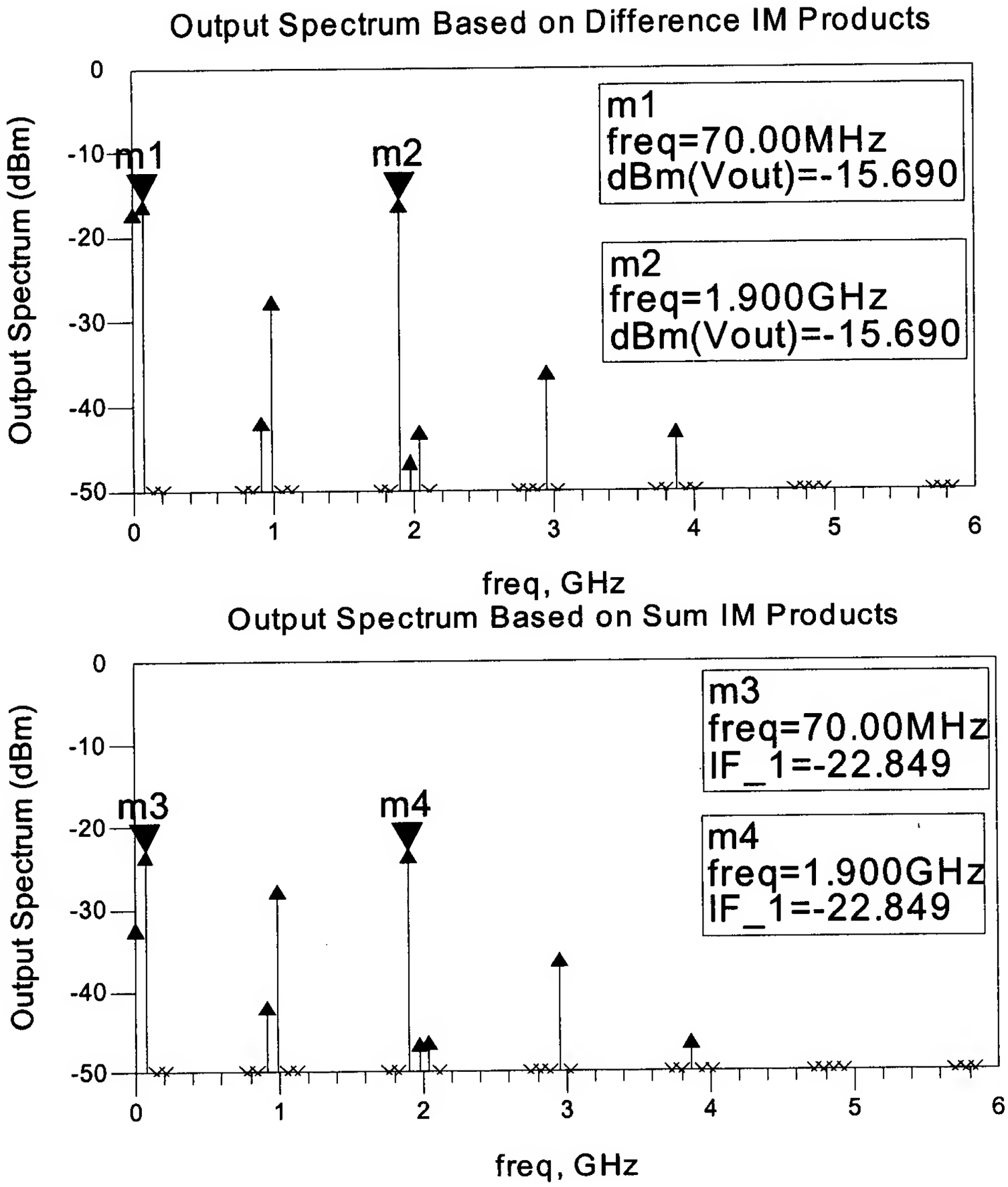
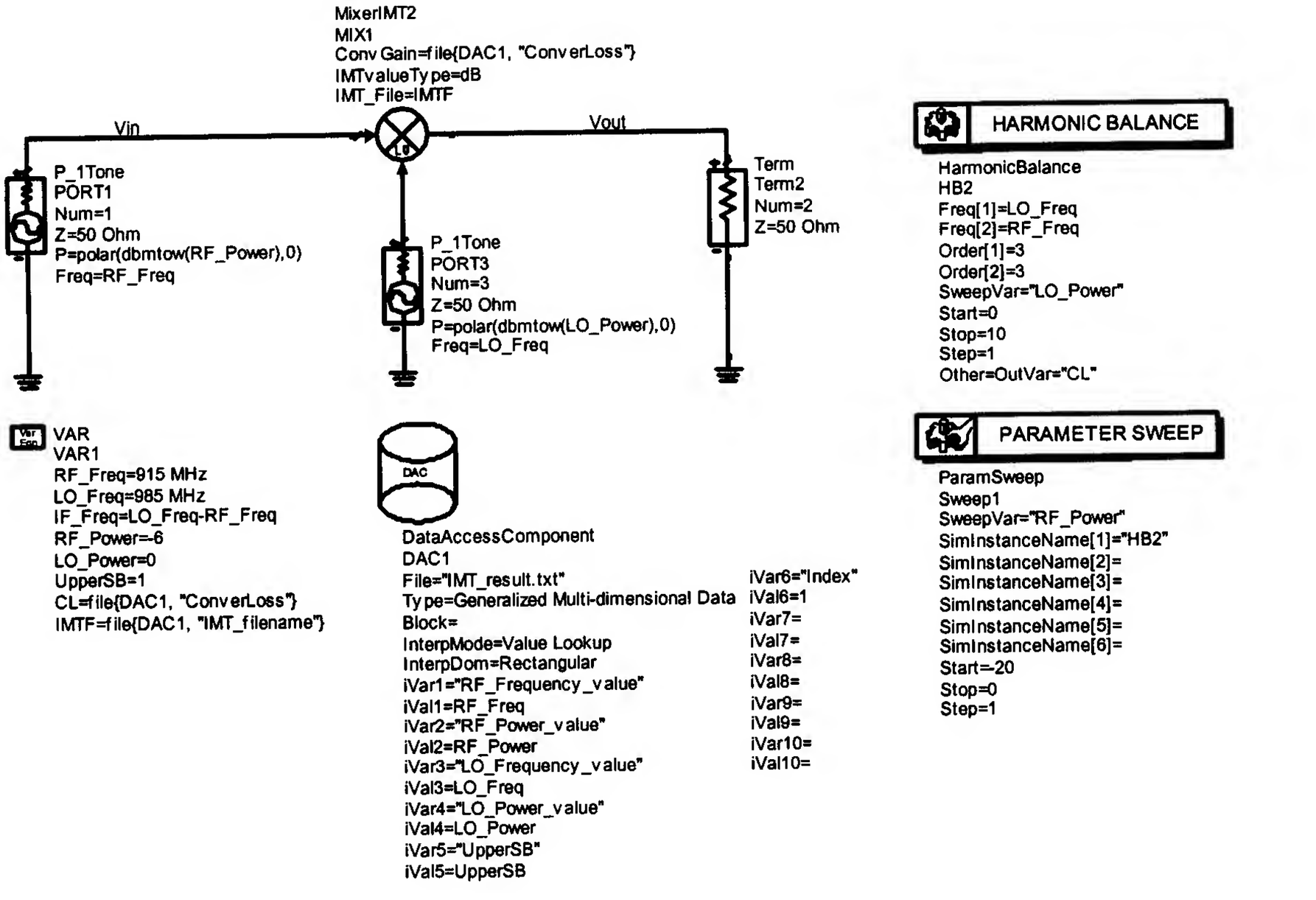

Output Spectrum Based on Difference IM Products
Output Spectrum (dBm)
0
-10
-20
-30
-40
-50
m1
m2
m1
freq=70.00MHz
dBm(Vout)=-15.690
m2
freq=1.900GHz
dBm(Vout)=-15.690
0
1
2
3
4
5
6
freq, GHz
Output Spectrum Based on Sum IM Products
Output Spectrum (dBm)
m3
m4
m3
freq=70.00MHz
IF_1=-22.849
m4
freq=1.900GHz
IF_1=-22.849
freq, GHz

Fig. 13



Stimulus condition	RF Frequency	RF Power	LO Frequency	LO Power
	915 MHz	-20 – 1 dBm	985 GHz	0 – 10 dBm

Fig. 14

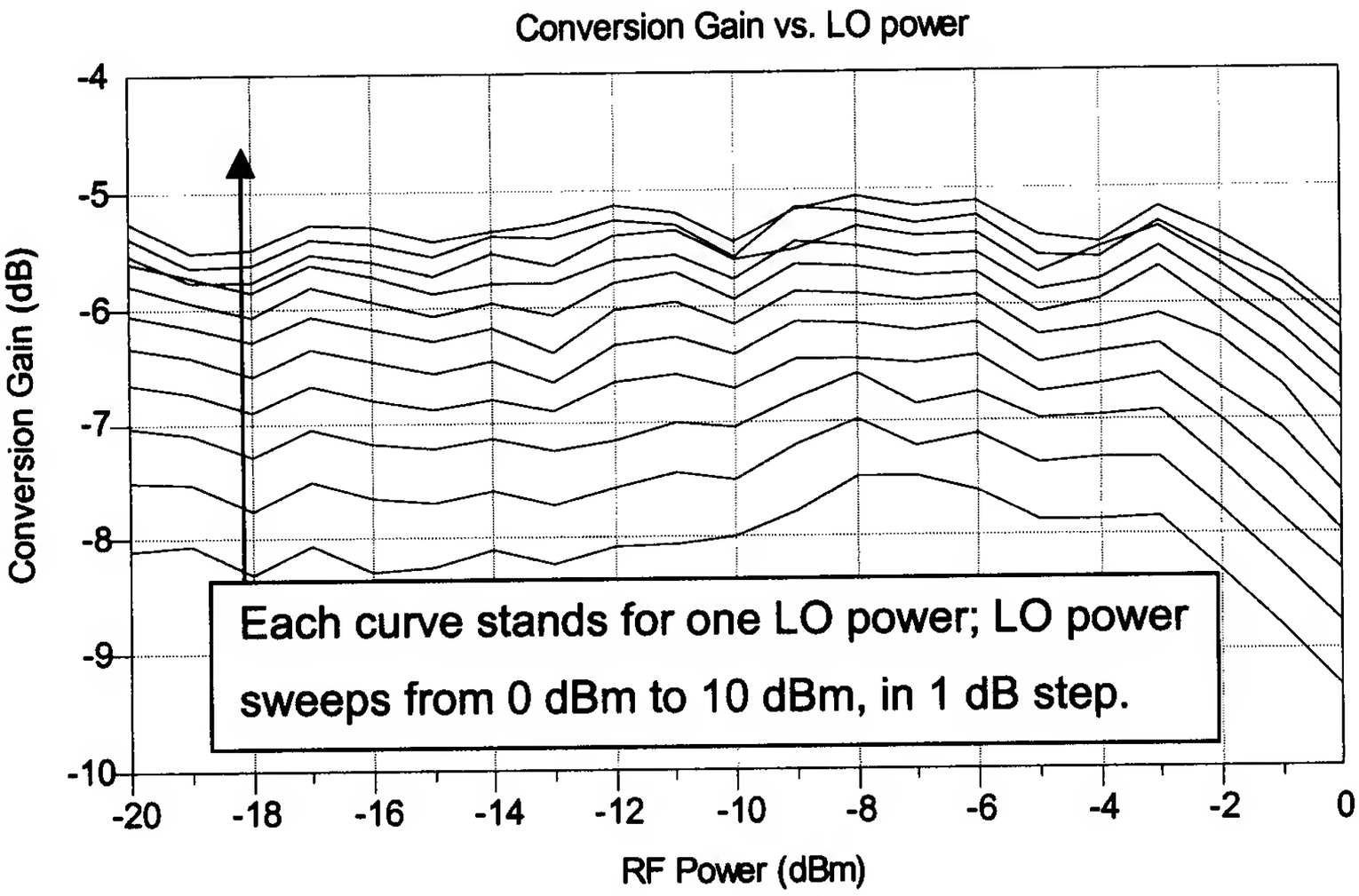

Conversion Gain vs. LO power
Conversion Gain (dB)
-4
-5
-6
-7
-8
-9
-10
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
RF Power (dBm)
Each curve stands for one LO power; LO power sweeps from 0 dBm to 10 dBm, in 1 dB step.

Fig. 15

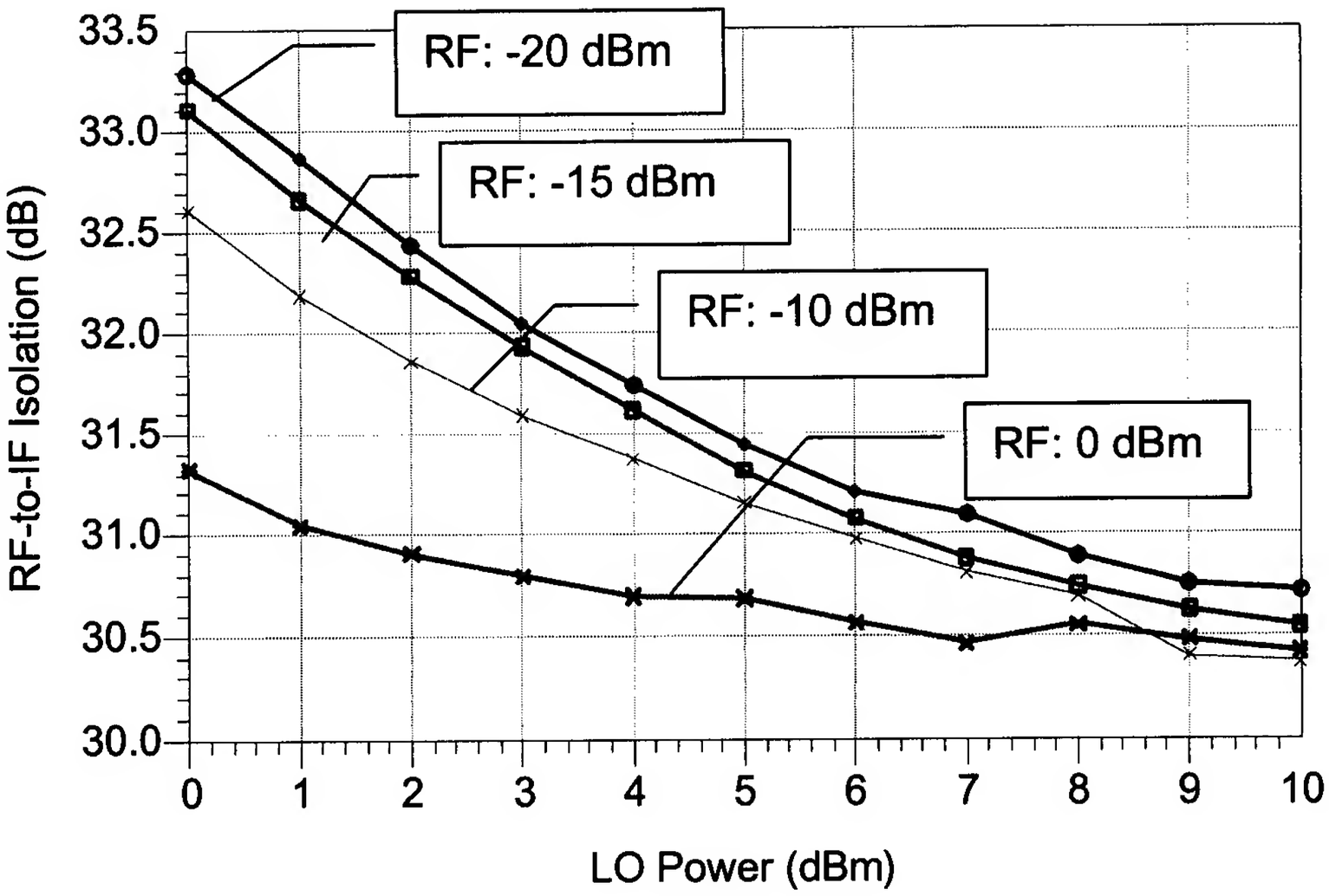

RF: -20 dBm
RF: -15 dBm
RF: -10 dBm
RF: 0 dBm
RF-to-IF Isolation (dB)
33.5
33.0
32.5
32.0
31.5
31.0
30.5
30.0
0
1
2
3
4
5
6
7
8
9
10
LO Power (dBm)

Fig. 16

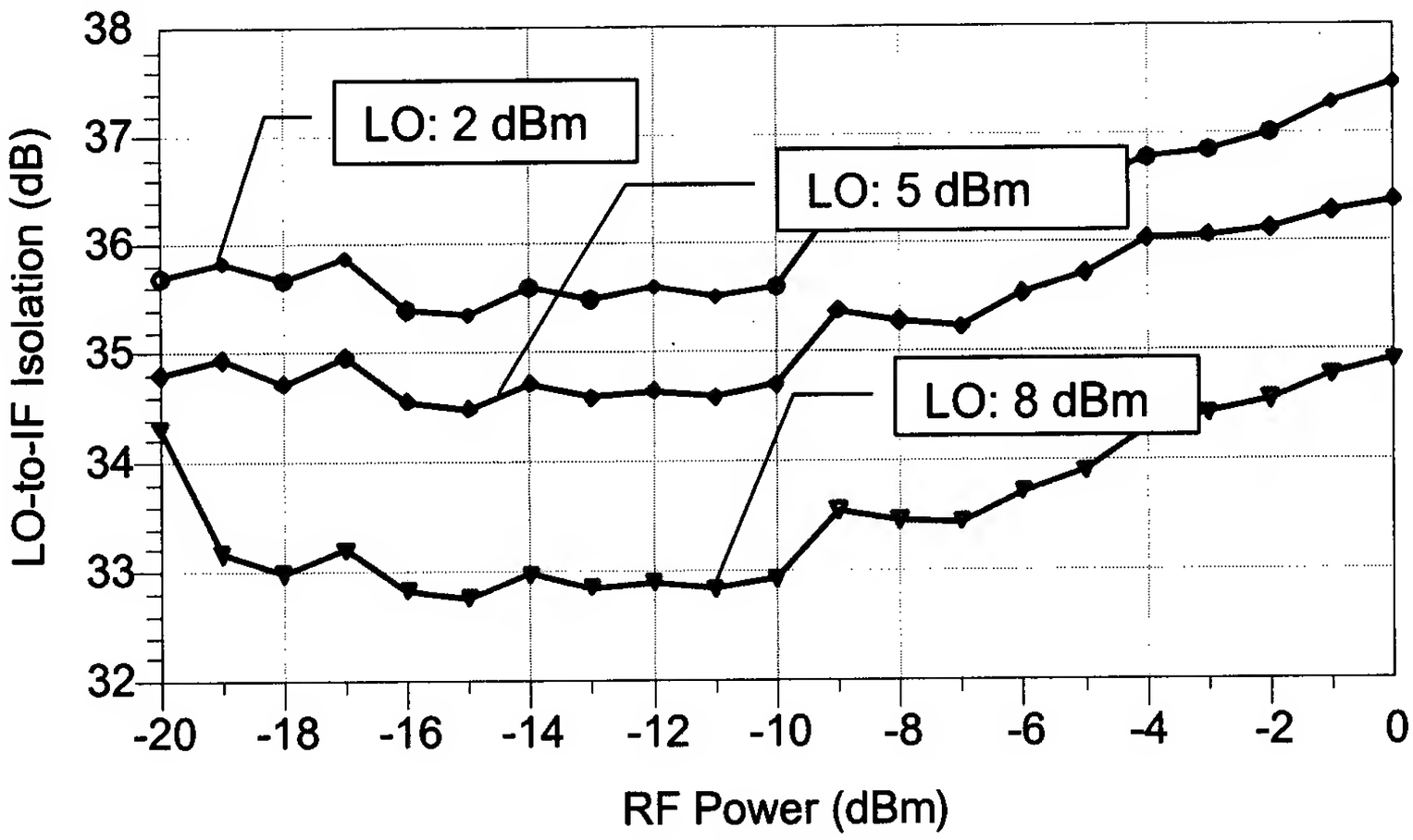
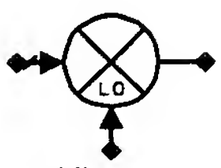

LO: 2 dBm
LO: 5 dBm
LO: 8 dBm
LO-to-IF Isolation (dB)
RF Power (dBm)
38
37
36
35
34
33
32
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0

Fig. 17



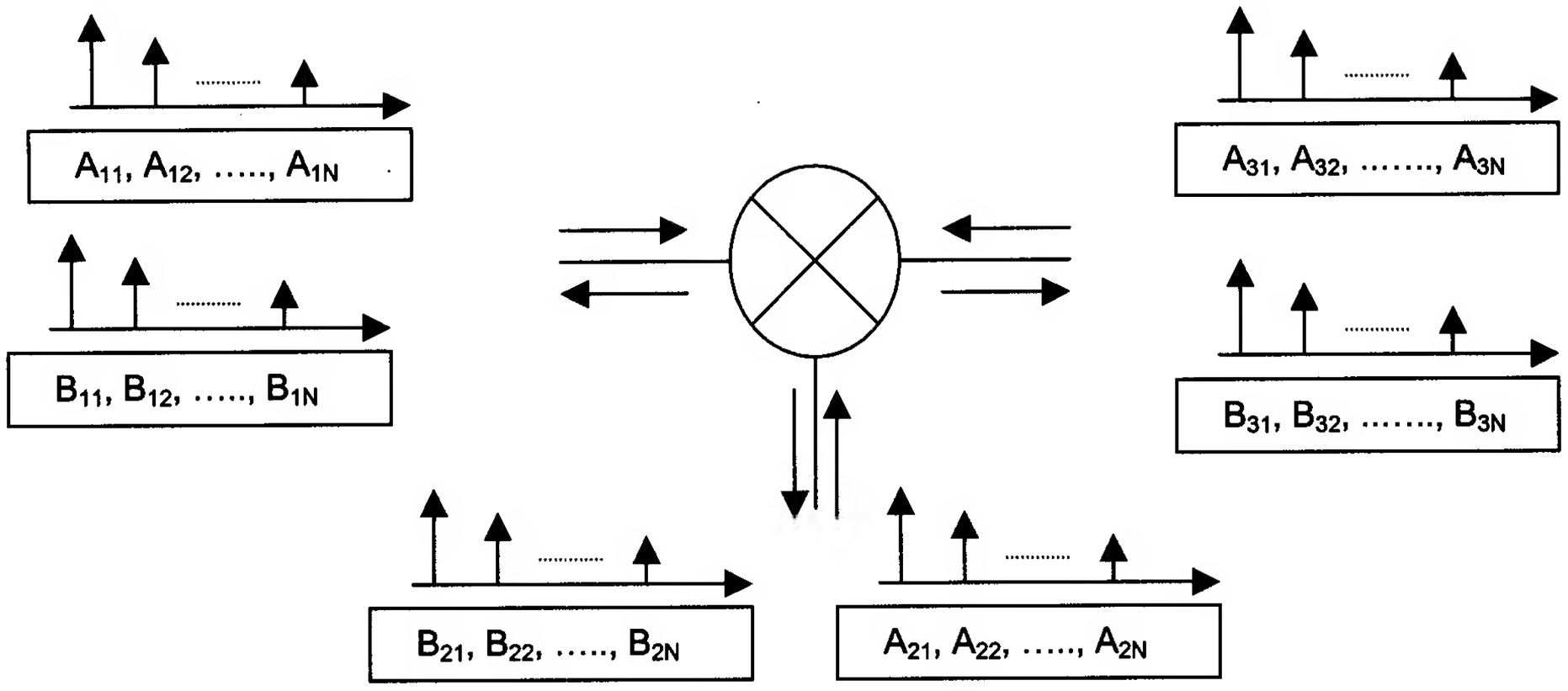
Mixer
MIX1

SideBand=UPPER	Z2=	ImpDeltaFreq=
ImageRej=	Z3=	ImpMaxOrder=
LO_Rej1=	GainCompType=LIST	ImpWindow=
LO_Rej2=	GainCompFreq=	ImpRelTol=
RF_Rej=	ReferToInput=OUTPUT	ImpAbsTol=
ConvGain=dbpolar(0,0)	SOI=	
S11=polar(0,0)	TOI=	
S22=polar(0,180)	Psat=	
S33=0	GainCompSat=5.0 dB	
PminLO=	GainCompPower=	
NF=	GainComp=1.0 dB	
NFmin=	GainCompFile=	
Sopt=	ImpNoncausalLength=	
Rn=	ImpMode=	
Z1=	ImpMaxFreq=	

Fig. 18

```
% File format constructed based on the parameter list of the Mixer model
% S11 S12 S13 S21 S22 S23 S31 S32 S33 Z1 Z2 Z3 SOI TOI GainCompPower GainComp
XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX XXX
```

Fig. 19


$A_{11}, A_{12}, \ldots\ldots, A_{1N}$
$B_{11}, B_{12}, \ldots\ldots, B_{1N}$
$A_{31}, A_{32}, \ldots\ldots, A_{3N}$
$B_{31}, B_{32}, \ldots\ldots, B_{3N}$
$B_{21}, B_{22}, \ldots\ldots, B_{2N}$
$A_{21}, A_{22}, \ldots\ldots, A_{2N}$